REMARKS/ARGUMENTS

On ***November 10, 2010***, Applicant filed an Amendment in response to an Office Action mailed in this application on ***May 11, 2010***. On ***November 12, 2010***, a Notice of Non-Compliant Amendment was mailed, in which the ***November 10, 2010*** Amendment was identified as being non-compliant because new claims 52 - 57 were underlined. By this Corrected Amendment, the underlining of claims 52 -57 in the Amendment filed on November 10, 2010 has been eliminated. As such, it is believed that this Corrected Amendment constitutes a complete response to the Notice of Non-Compliant Amendment mailed November 12, 2010.

Reconsideration of this application is respectfully requested. To this end, petition is hereby made for a three-month extension of time to respond to the outstanding Final Office Action of May 11, 2010. In addition, a Request for Continued Examination of this application is hereby made, a more formal version of this request being filed with this Amendment After Final Rejection. Although the fees for the extension of time and the request for continued examination are being submitted with this Amendment After Final Rejection, the Commissioner is hereby authorized to charge any deficiency, or credit any overpayment, in the fee(s) filed, or asserted to be filed, or which should have been filed herewith (or with any paper hereafter filed in this application by this firm) to our Account No. 14-1140.

Claims 1-5 and 35-51 are pending in the application, with claims 6-17 having been previously cancelled, and with claims 18-34 having been previously withdrawn by the Examiner from further consideration as being directed to a non-elected invention.

Upon entry of this Amendment, claims 1 and 43 will be amended to clarify the claimed invention, claims 2-5, 35-37, 40, 44-46 and 49-51 will be amended to better conform such claims

to U.S. claim practice, claims 38, 39, 47 and 48 will be cancelled and new claims 52-57 will be added.

In the outstanding Final Office Action, the Examiner rejected claims 40 and 49 under 35 U.S.C. §112, second paragraph, as being indefinite, contending that there is insufficient antecedent basis in the claim for the limitation "the magnitude of a magnetron discharge." Claims 40 and 49 have now been amended to provide a sufficient antecedent basis for this limitation. As such, it is believed that the §112 rejection of claims 40 and 49 should now be withdrawn.

In the outstanding Final Office Action, the Examiner also rejected claims 1-5, 35-38, 40-41, 43-46 and 48-50 under 35 U.S.C. §103 (a) as being unpatentable over Saigal *et al.* (U.S. Publication No. 2004/0112735) in view of Wang *et al.* (U.S. Patent No. 6,413,382), and claims 39, 42, 47 and 51 under 35 U.S.C. §103 (a) as being unpatentable over Saigal *et al.* and Wang *et al.* in view of Mimura *et al.* (JP No. 07150348). The Examiner's rejections are respectfully traversed.

A. <u>Claim Amendments and Support for Same</u>

In amended independent claims 1 and 43, the wording regarding the pulsed discharges produced has been amended by adding "by providing a pulsed current to said first electrodes from a first pulse generator". Applicant notes that support for this claim amendment may be found at least in paragraph [0114] of the published version of the present application, *i.e.,* USPTO electronic Publication No. US-2006-0278518-A1.

Further, regarding the potential applied to the work piece, this limitation states that the potential is applied "from a second pulse generator including a DC power supply for charging a

capacitor". Applicant notes that support for this amendment can be found at least in Figure 3 and paragraph [0118] of the published version of the present application.

Still further, regarding the biasing pulses, this limitation states "said biasing pulses being produced from a charge of said capacitor". Applicant notes that support for this amendment can be found at least in paragraph [0114] and Figure 3 of the published version of the present application.

Applicant notes that support for new dependent claims 52-55 may be found at least in paragraph [0125] of the published version of the present application.

New claims 52 and 55 refer to a biasing switch being between the second pulse generator and the work piece, and to opening the biasing switch if the magnitude of the pulse current is above a predetermined threshold. Applicant notes that support for these claims can be found at least in paragraph [0125] and in Fig. 3 of the published version of the present application.

New claims 53 and 56 refer to the biasing switch being an arc suppression component, which opens if a concentrated or diffused arc is formed. Applicant notes that support for these claims can be found at least in paragraph [0125] of the published version of the present application.

New claims 54 and 57 refer to the biasing switch as a solid state switch. Applicant notes that support for these claims can be found at least in original claim 34.

B. <u>The Claimed Invention is Not Obvious Over Saigal in View of Wang</u>

As noted above, the Examiner rejected claims 1-5, 35-38, 40-41, 43-46 and 48-50 under 35 U.S.C. § 103 (a) as being obvious over Saigal in view of Wang. The Examiner's rejection is respectfully traversed.

Both of independent claims 1 and 43 contain the limitations of a first and a second pulse generator, where the second pulse generator includes a DC power supply for charging a capacitor, and biasing pulses being produced from a charge of the capacitor.

(i) Electrical configuration of the work piece in Saigal

Applicant notes that in Saigal the work piece (wafer 148) is electrically connected to a source 210 applying RF power to the pedestal electrode 152 (paragraph [0046] and Figure 6 of Saigal).

Applicant contends that Saigal does not teach providing a first and a second pulse generator, where the second pulse generator, applying a potential to the work piece, includes a DC power supply and a capacitor to produce biasing pulses from the charge of the capacitor. Rather, Applicant contends that, Saigal teaches in paragraphs [0046] and [0047] to continuously apply RF power to the pedestal electrode 152 and the work piece (wafer 148) from an RF power source.

(ii) Electrical configuration of the work piece in Wang

Applicant also notes that in Wang, the work piece (wafer 20 on pedestal 18, *see* Figure 1 and column 3, line 64 of Wang) is electrically connected to a bias power supply 44 (*see* Figure 1 and column 4, line 52 of Wang). Wang teaches that a computerized controller 58 controls a bias power supply 44, however, Wang does not disclose further details about the applied potential and about the configuration of the bias power supply 44. In particular, Wang does not teach providing at the work piece a second pulse generator including a capacitor and DC power supply.

Therefore, Applicant contends that the method described in claims 1 and 43 of the present application is not obvious from Saigal and Wang. In this regard, Applicant further contends that a person of ordinary skill in the art would not consider combining the teaching of

Wang and Saigal because the documents provide contradicting teaching. Saigal specifically teaches a lower limit for the duty cycle of 1/8 (*see* paragraph [0044] of Saigal), whereas Wang operates at duty cycles below this limit (*see* column 5, line 56 of Wang, "less than 10%").

Applicant thus contends that even if a person of ordinary skill in the art were to apply the teachings of Wang to the invention disclosed in Saigal, this would not lead to the claimed invention, since neither of the documents teaches providing a second pulse generator including a DC power supply and a capacitor. Applicant further contends that a person of ordinary skill in the art would understand that a pulse generator is different from an RF power supply. Thus, Applicant also contends that it would not have been obvious for a person of ordinary skill in the art to apply the teaching of Saigal and Wang to the method described in independent claims 1 and 43 of the present application using a pulse generator instead of an RF power supply (Wang) or an RF power supply (Saigal).

C. <u>The Claimed Invention is not Obvious Over Saigal, Wang and Mimura</u>

As also noted above, the Examiner also rejected claims 39, 42, 47 and 51 under 35 U.S.C. §103 (a) as being obvious over Saigal and Wang in view of Mimura. Here again, the Examiner's rejection is respectfully traversed.

(i) Mimura applies pulses to the target, not to the work piece

Applicant notes that Mimura discloses a capacitor C1 used as power source of a switching circuit SW for applying superimposed pulses of reverse polarity to a load R_L. However, the load R_L that this circuit is connected to is disclosed as a target, *i. e.,* like the first electrodes in claims 1 and 43 of the present application, but not as the work piece, *i. e.* like the second electrodes in these claims.

In contrast, Applicant further notes that the amended independent claims 1 and 43 contain the limitation that the second pulse generator including a DC power supply and a capacitor is connected to the work piece, *i. e.* the second electrode.

Therefore, Applicant contends that the claimed invention of the present application is not obvious over Saigal and Wang in view of Mimura. Applicant further contends that it would not have been obvious to a person of ordinary skill to combine the teachings of Saigal, Wang and Mimura. Applicant also contends that even if a person of ordinary skill in the art would have combined the teachings of these three references, this would still not lead to the method of claims 1 and 43, because the capacitor and charging DC power supply would be connected to the target, not the work piece.

(ii) Mimura does not generate a discharge from a capacitor charge

Applicant notes that in Mimura there is no discharge generated from the capacitor charge. In contrast, the capacitor charge is used to extinguish the unwanted electric arc discharge by applying reverse polarity pulses. Thus, Applicant concludes that Mimura does not supply energy to a discharge, but takes away energy from a discharge. A combination of Saigal and Wang with Mimura would thus not lead to the method of claims 1 and 43.

(iii) In a combination of the documents, the frequency would not be the same

Applicant further notes that in Mimura the application of the reverse polarity pulses is controlled by a switching circuit SW and a transmission circuit OSC. Thus, the superimposed pulses appear with a predetermined frequency.

If, assuming arguendo, a person of ordinary skill in the art would consider a combination of Saigal and Wang, with both teaching supplying pulse power to the target (pulse type power source 200 in Saigal, *see* Figure 5 and paragraph [0038] in Saigal, and pulsed supply 80 in

Wang, *see* Figure 1 and column 5, line 17-67 of Wang) of specific predetermined frequencies (Saigal: 1-100 Hz; paragraph [0043], Wang: 50-500 Hz, column 5, line 67) with Mimura teaching specific pulses according to an externally applied control, this combination would not include the limitation that the pulsed current between the work piece and the anode has the same frequency as the pulsed discharges between the anode and the magnetron sputtering cathode. None of the documents contains such a teaching.

D. The Dependent Claim Rejections

Claim 2

Applicant notes that, as recited in present claim 1, the plasma blobs mentioned are not deposited material, but plasma moving within the processing chamber.

Applicant further notes that claim 2 recites that biasing discharges are produced between the anode and the work piece. This is different from Saigal, where only a plasma between the target and anode is mentioned (paragraph [0046] of Saigal) and the RF power supplied to the pedestal electrode is disclosed to couple "supplemental energy to the plasma" (paragraph [0046] of Saigal). In contrast, present claim 2 relates to biasing discharges as separate discharges, occurring between the anode and work piece.

Applicant contends that separate biasing discharges are neither mentioned nor suggested in Saigal, Wang, or Mimura.

Claim 5

Applicant notes that present claim 5 provides that the biasing pulses are terminated after the end of the decay of the plasmas created, *i.e.,* last longer than the pulsed discharges between the first electrodes. The present application explains this in paragraph [0047] of its specification,

stating that "the duration of the plasma producing discharges is smaller than the duration of the biasing discharges".

Applicant contends that such is neither mentioned nor suggested in Saigal, Wang, or Mimura.

Claims 40 and 49

Applicant notes that claims 40 and 49 include the limitation that a magnitude of a biasing current is at least 10% of a magnitude of a magnetron discharge current. In this respect, the Examiner contends that Saigal discloses the pulsed discharge at 5 kW, with the biasing pulses also at 5 kW, the magnitude of the biasing pulses thus being 100% of the pulsed discharges.

Applicant notes that Saigal discloses in paragraph [0047] that "the pedestal 152 may be supplied with RF power in a range of 10 W to 5 kW, for example, a more preferred range being 150 to 300 W for a 200 mm wafer in SIP deposition".

Applicant further notes that Saigal discloses in paragraph [0038] that "the target 146 is preferably negatively biased by a pulse type power source 200 to provide an average power of 1-80 kW, for example. . . . A suitable power range for the minimum power P_{min} of the power pulse train 202 is believed to be 0.1 to 5 kW with a range of 100 W to 1 kW preferred."

Applicant notes that Saigal does not teach a ratio of the current values. Instead, the cited power values are mentioned separately, without any comparison.

Applicant further contends that it is improper to derive a teaching from Saigal related to a ratio of current values from a comparison between two separately disclosed power value intervals. Specifically, Applicant contends that if a ratio is to be calculated, comparable values should be used. In this regard, Applicant notes that the given maximum of power at the target is 80 kW (paragraph [0038] of Saigal) and the maximum power at the work piece is 5 kW

(paragraph [0047] of Saigal), thus the ratio 5/80 is 6.25%. For the illustrated embodiment, Saigal teaches providing an average power of 15-30 kW (paragraph [0044] of Saigal) at the target and a preferred power of 150-300 W at the pedestal (paragraph [0047] of Saigal), resulting in an even lower ratio.

Thus, Applicant contends that Saigal does not disclose the subject matter of claims 40 and 49.

Claims 52, 53, 55, and 56

Applicant notes that, according to new claims 52, 53, 55, and 56, a biasing switch is provided between the second pulsed generator and the work piece, and the biasing switch is opened, if a magnitude of the pulsed current is above a predetermined threshold. The biasing switch may work as an arc suppression component, if it opens in case an arc is formed between the work piece and the anode.

This is taught neither by Saigal, where no work piece switch is provided between the RF power source 210 and the work piece 148 (see figure 5/figure 6 of Saigal), nor by Wang (where again no switch is provided between the power source 44 and the pedestal 18, *see* Figure 1 of Wang), nor by Mimura, where the DC power source is also directly connected without a switch to the load R_L (see figure 1 of Mimura).

Claims 54 and 57

Applicant notes that, according to new claims 54 and 57, the biasing switch is a solid state switch. This is not taught by either Saigal, Wang or Mimura.

E. Conclusion

In view of the foregoing, applicant believes that all of the claims remaining in the application, i. e. claims 1-5, 18-37, 40-46, 49-51 and new claims 52-55 are now in condition for

allowance, which action is earnestly solicited. If any issues remain in the application, the Examiner is urged to contact the undersigned at the telephone number listed below.

Respectfully submitted,

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